WHITE RIVER BRIDGE
Mount Rainier National Park
Spanning White River on Yakima Park Highway
Longmire Vicinity
Pierce County
Washington

HAER No. WA-53

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
P.O. Box 37127
Washington, D.C. 20013-7127

HAER
WASH
27-LONG.V,
25-

HISTORIC AMERICAN ENGINEERING RECORD

WHITE RIVER BRIDGE
Mount Rainier National Park
HAER No. WA-53

I. INTRODUCTION

Location:	Spanning White River on White River Road (Yakima Park Highway), 6 miles west of Mather Memorial Parkway, Mount Rainier National Park, Pierce County, Washington. Quad: White River Park, Wash. UTM: 10/605280/5194560
Date of Construction:	1928-29
Structure type:	Stone-faced reinforced concrete spandrel arch girder bridge
FHwA Structure No.:	9450-02BP
Designer and Engineer:	Western Regional Office, Bureau of Public Roads, San Francisco, California
Architectural Plans:	National Park Service, Division of Landscape Architecture, San Francisco, California
Contractor:	John D. Tobin, Portland, Oregon
Owner:	Mount Rainier National Park, National Park Service
Use:	Park highway bridge
Significance:	The longest of the stone-faced reinforced concrete arch bridges in Mount Rainier National Park, the White River Bridge exemplifies the National Park Service's "rustic style" of architecture through its use of a rubble masonry veneer, which helps the structure integrate with its setting.
Project Information:	Documentation of the White River Bridge is part of the Mount Rainier National Park Roads and Bridges Recording Project, conducted in summer 1992 by the Historic American Engineering Record. Richard Quin, Historian, 1992

II. HISTORY

This is one in a series of reports prepared for the Mount Rainier National Park Roads and Bridges Recording Project. HAER No. WA-35, MOUNT RAINIER NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. WA-126, YAKIMA PARK HIGHWAY, contains more specific information on the road on which the structure is located.

Yakima Park Highway

The Yakima Park Highway, built between 1927 and 1931, replaced the old White River Road to Glacier Basin built by mining interests in the 1910s, and continued up the northeast shoulder of Mount Rainier to the high subalpine meadows at Yakima Park (Sunrise). The road was surveyed and constructed under the supervision of the Bureau of Public Roads (BPR), which in 1925 assumed responsibility for major road projects in the national parks.

The 15.5-mile Yakima Park Highway leaves the Mather Memorial Parkway [HAER No. WA-125] at the "White River Wye," 5 miles south of the northeast park entrance and three miles north of Cayuse Pass. The road runs southwest for 4 miles, crossing rustic style bridges at Dry (Deadwood) Creek [HAER No. WA-49] and Klickitat Creek [HAER No. WA-50] and a plain steel girder and reinforced concrete replacement span over Shaw Creek. The road then makes a looping curve to cross the Fryingpan Creek Bridge [HAER No. WA-54] and swings northwest another mile to the White River crossing. From this point, a graveled road provides access to the White River Campground and the Glacier Basin trail. The main road begins to climb a series of switchbacks to Sunrise Point, where it makes a final swing to the west to reach the Sunrise development at Yakima Park. Sunrise is the highest point (elev. 6,450') reached by the park road system.

White River Bridge

The longest of the stone-faced reinforced concrete arch bridges in Mount Rainier National Park is the White River Bridge on the Yakima Park Highway (White River Road), constructed in 1928-29. The bridge was required as part of the late 1920s reconstruction of the old White River Road and its extension to Yakima Park, where the new Sunrise development was established. Construction of the road required a long arch bridge over White River.

A Bureau of Public Roads party under the charge of Associate Highway Engineer C. R. Short conducted the location surveys for the new road in 1925. As part of this work, the crew determined the location for the new White River Bridge. The site selected was the Wonderland Trail crossing, located a mile and a half below that stream's confluence with the Inter Fork in a deep forested valley between Goat Island Mountain and Sourdough Ridge. In his survey report, Short described the site:

> A very good bridge location is available at the Wonderland Trail crossing, approximately one-mile up White River from the mouth of Frying Pan Creek. The river is here confined between solid granite banks, requiring a single span of not more than 80 feet. This is the first permanent bridge site available above the one near the mouth of Silver Creek and is the best at any point on White River.[1]

Once the survey plans were approved by the National Park Service in August 1926, the BPR was instructed to prepare plans and specifications for the bridge. These were prepared at the Bureau's Western Regional Office in San Francisco, California in 1927 and 1928.[2] Architectural plans (determining the basic design appearance of the structure, not construction details) were

prepared by the Park Service's Division of Landscape Architecture, also based in San Francisco, in June 192B.[3] Following approval of the designs by the National Park Service Washington office, the Department of the Interior authorized the advertising of the project.

On 20 July 192B, the bids were opened at the BPR District 1 office in Portland, Oregon. The low bidder was John D. Tobin of Portland, Oregon, who submitted an estimate of $33,345. Tobin had just completed the construction of the Christine Falls Bridge [HAER No. WA-4B] and the Paradise River First Crossing Bridge [HAER No. WA-47] at Narada Falls, and his work had been judged satisfactory. On the recommendation of BPR District Engineer W. H. Lynch and Mount Rainier National Park Superintendent O. A. Tomlinson, Tobin was awarded the contract. The contract was signed by the Secretary of the Interior on 9 August 192B. Tobin opened his construction camp at the bridge site on 15 August and began work four days later on the excavations for the abutments. About twenty men were employed on the project. Supplies were hauled by truck approximately 45 miles from Enumclaw, the nearest railhead. An old log truss bridge for the Wonderland Trail was located on the site, right on the center line for the new roadway. The old bridge was raised, put on rollers, and moved 30' downstream so that it could be used during construction. After the new bridge was completed, it was torn down and burned.[4]

Tobin subcontracted all the hauling, rubble masonry, arch voussoirs, sand, gravel and spandrel fill. Except for the placing of the fill, the BPR supervising engineer reported no problems with these arrangements. Excavation and concrete work was done by Tobin's own forces.[5]

The excavations for the arch abutments and wall footings entailed no problems. Both abutments were excavated to solid rock, and enough rock was removed to insure a good key or connection between the abutment and the rock. To further secure the abutments, holes were drilled in the rock to accommodate 1¼" steel dowels which would be embedded in the concrete.[6]

In the preliminary specifications, the BPR engineers estimated that the following quantities of materials would be required for the construction of the bridge:

Structure excavation (removed)	125 cu. yds.
Class "D" concrete	275 cu. yds.
Rubble masonry	520 cu. yds.
Membrane waterproofing	3B0 sq. yds.
Spandrel fill	1,400 cu. yds.
Reinforcing steel	46,000 lbs.
Arch voussoirs	120 sq. yds.
Rubble handrail	360 lin. ft.
Rubble curb	1B0 lin. ft. [7]

The above quantities, being construction estimates, were likely revised somewhat due to field requirements. The sand and gravel for the concrete came from the river bed about a mile below the bridge site. Collection and hauling of these materials was sublet to Higdon Brothers of Woodburn, Oregon. They used two one-yard Ford trucks with gravity dump bodies, filling them by hand at the pit. Higdon Brothers operated a washing plant at the pit; this consisted of a revolving screen with 1 3/4" openings for the gravel and 1/4" openings for the sand. A stream of water was directed at the revolving screen and washed gravel and organic matter free from the sand.[8]

The rubble masonry work was sublet to Camillo and Gerke. The stone was obtained from a quarry opened in a sidehill cut on the roadway about three hundred feet above the bridge site. The black and white granite proved very

satisfactory for the construction. Much of the rock was split at the quarry, which resulted in a savings of time when the masonry was placed. A 40' boom derrick with a two drum steam hoist was used to handle the rock and load light rail cars which carried the stone on tracks down to the bridge site. At the bridge, the stones were subsequently placed with a smaller 25' boom derrick operated by hand crabs. Some of the large rocks in the wall measured 7' long and weighed up to 500 pounds. Camillo and Gerke lost considerably on their subcontract; they had bid the work at $15 per square yard of exposed arsa, but the work cost them about $35 per square yard.[9]

The shapes of the arch ring stones or voussoirs were determined in the architectural plans prepared by the National Park Service Landscape Architecture Division.[10] The individual stones were cut from wooden templates and the edges carefully finished to ensure a tight fit. The stones were erected on falsework after the abutments were completed. Because of the rock bottom and swift water in the river channel, forms wers ersсted on truss work rather than ordinary trestle formwork. A log crib, 6' x 40' in dimension and 4' high, was constructsd in the center of ths channel, dividing the span of the arch in half. Six "A" frame trusses with 40' spans were used on each half. These were framed on shore from 12" x 12" timbers and then erected in place. The trusses were joined by 2" x 12" stringers spaced 16" apart under the concrete and 9" apart under the voussoirs. The formwork decking was made from 2" x 6" planks.[11]

Once the falsework was erected, reinforcing steel was then placed before the concrete was poured. This manner of construction allowed the massive arch ring stones to serve as formwork for the outer walls of the concrete barrel arch. Iron cramps, 3/4" in diameter, extended from the stones and were embedded in the concrete, providing for a very strong bond between the stones and the concrete.[12]

The reinforcing steel for the arch girders was ordered from the Pacific Coast Steel Company in Seattle, and consisted of deformed iron bars of structural or intermediate grade. The longitudinal arch ring bars were 1" diameter bars, 37' in length; latitudinal bars were 1⅛" diametsr cut to the same length. Abutment dowels were 1" in diameter and 10' in length. Spacer bars and spacer ring bars were each 1/2" diameter, 31' and 20' in length, respectively. All bars were cut and bent in the field. For the arch ring, the longitudinal bars were placed on 10" centers and the latitudinal bars on 2' centers. All concrete was Class "D", or a 1:2:3 mix. The following schedule was observed for pouring: First, the concrete for the abutmsnts was placed. Next, the crown section of each rib was poured, followed by the haunch sections, which were poured simultaneously. The two 3' keys were poured last.[13] A membrane waterproofing material was applied against the arch ribs and the exposed stone surfaces. A layer of hot asphalt was applied first, thsn a layer of impregnated fabric, laid overlapping the previous piece so as to form a two-ply membrane. Each strip was then mopped with asphalt to form a totally waterproof seal. After the asphalt had cured, a 1" layer of 1:2 mortar was spread over the back of the entire arch rib to prevent any puncture of the membrane.[14]

Following the pouring of the concrete, the rubble masonry spandrel walls and wing walls were erected. Early winter weather conditions forced a project shutdown in October, with the masonry work 70 percent complete. Contractor Tobin reestablished his work camp the first part of the following June and by the end of the month had nearly completed work on the structure.[15]

The contractor had made arrangements with Peter Starbo, general manager of the nearby Mount Rainier Mining Company, to provide ths compacted sarth fill for ths structure, but Starbo withdrew from the project after supplying only ons

hundred yards of material. In the spring of 1929, the remaining spandrel fill was obtained from A. C. Goerig of Seattle, who was the contractor on the adjacent roadway grading section. The material was dug with a gas shovel from a sidehill cut on the right-of-way and hauled to the site by truck.[16] Once the fill had been placed, the bridge railing was completed, and stone curbs were set for the bridle path. The bridge was surfaced with asphaltic concrete under a subsequent contract.

Contractor Tobin completed the White River Bridge on 17 July 1929, twenty-four days ahead of schedule, at a cost of $34,989.87. The work was accepted by BPR Senior Highway Bridge Engineer R. B. Wright, BPR Resident Engineer W. T. Utz, and Park Service Assistant Landscape Architect Ernest A. Davidson.[17] The wide-span stone-faced reinforced concrete arch structure was inspected that month by National Park Service Director Horace M. Albright who was visiting the park, and was accepted. Superintendent Tomlinson called it "one of the finest structures in the Northwest," and stated that it had already attracted a great deal of attention.[18]

A bridge safety inspection report prepared by the Federal Highway Administration in September 1975 indicated that the bridge was in good condition and required no special maintenance. It did suggest that the bridge railing did not meet current AASHTO specifications and that the approach alignment was less than desirable; however, no action was recommended.[19]

The White River Bridge remains in use. The Yakima Park Highway is open from summer to fall, and many visitors make the trip over the road each year. Unfortunately, few of these realize that they are crossing such an attractive arch bridge, as the sides of the structure are not visible from the road. The rubble stone guard rails are effective in helping the structure integrate into the setting, so most users do not notice the bridge, but rather the stunning view of the rock-strewn river below and the magnificent mountain scenery all around.

Description

The White River Bridge is a reinforced concrete filled spandrel arch structure faced in native granite masonry. It is located approximately six miles of the Mather Memorial Parkway; at this point, the White River's channel changes from a rock-strewn floodplain to a narrow rock canyon, where good footings were obtained. The location is in a mixed conifer zone at an elevation of 3920'. The bridge measures 180' long and 35' wide, and carries a double-lane roadway 24' wide and a 7' bridle path on the northwest or upstream side. It spans the White River on a single semi-elliptical arch with a clear span of 90', rising 18' from the springing line. The arch is defined by cut voussoirs ranging from 3'8" to 8'10" in height and generally about 2' to 3' wide at their broadest points. The bridge is built on a tangent with only the point over the southwest abutment on a 36° curve. The masonry guard rail is cambered, rising from 3' in height at the ends to 4' at the center of the span, and flares gently at both ends. The roadway is not superelevated like most of the park bridges but does feature a very gentle 1½" crown at center to provide for good drainage. Approaches are 45' long on both sides. The bridge is filled with compacted earth and surfaced with asphaltic concrete. The unaltered bridge is in good condition and appears to be well maintained.

III. ENDNOTES

1. C. R. Short, Associate Highway Engineer, Bureau of Public Roads, "Location Survey Report (1932) on Yakima Park Highway, Route No. 3, Mt. Rainier National Park, State of Washington," (Portland, OR: Bureau of Public Roads, District No. 1, 1932), 1.

2. U.S. Department of Agriculture, Bureau of Public Roads, "Mt. Rainier National Park, White River Arch, Yakima Park Road, East Boundary-White River Crossing Sect., Pierce County, WN" (sic). Construction drawing P-15-7 (Portland, OR: Bureau of Public Roads, District No. 1, 8 June 1928). Engineering Division files, Mount Rainier National Park; R. R. Tipton, Assistant Highway Engineer, Bureau of Public Roads, "Final Report (1929) on White River Bridge, White River Road, Mt. Rainier National Park, State of Washington, 3-A1, 3115" (Portland, OR: Bureau of Public Roads, 1929), 1.

3. U.S. Department of the Interior, National Park Service, Division of Landscape Architecture, "Architectural Plans, White River Bridge, Yakima Park Highway, Mt. Rainier National Park," Construction drawing R 184 (San Francisco, CA: National Park Service, Division of Landscape Architecture, 14 June 1928). Engineering Division files, Mount Rainier National Park.

4. Tipton, 1-2, 6; O. A. Tomlinson, Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, July 1928, 6; Idem, Superintendent's Monthly Report, August 1928, 6. Mount Rainier National Park [MORA] Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file; John H. Edwards, Assistant Secretary of the Interior, to J. D. Tobin, Portland, Oregon, 31 July 1928. National Archives, RG 48 Box 1991 File 12/7, Mount Rainier National Park contracts.

5. Tipton, 2.

6. *Ibid.*, 2-3.

7. Bureau of Public Roads, "Mt. Rainier National Park, White River Arch, Yakima Park Road, East Boundary-White River Crossing Sect., Pierce County, WN" (sic), Construction drawing P-15-7, (Portland, OR: Bureau of Public Roads, District No. 1, 8 June 1928). Engineering Division files, Mount Rainier National Park.

8. Tipton, 3.

9. *Ibid.*, 4-5.

10. See "Arch Ring Layout, White River Arch, Yakima Park Road, Mt. Rainier National Park." Construction drawing R 814, sheets 1 & 2 (San Francisco, CA: National Park Service, Division of Landscape Architecture, 3 August 1928). Engineering Division files, Mount Rainier National Park.

11. Tipton, 3-4.

12. See BPR construction drawing P-15-7.

13. See pouring schedule on *Ibid.*.

14. Tipton, 5.

15. Tomlinson, Superintendent's Monthly Report, October 1928, 4; Superintendent's Monthly Report, June 1929, 6. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

16. Tipton, 5.

17. Tipton, 2, 6; Arno B. Cammerer, Acting Director, National Park Service, to Secretary of Interior, 13 August 1929. National Archives, RG 48 Box 1991 File 12/7, Mount Rainier National Park Roads.

18. Tomlinson, Superintendent's Monthly Report, July 1929, 2, 5. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

19. U.S. Department of Transportation, Federal Highway Administration, "Bridge Safety Inspection Report, White River Bridge, Mt. Rainier National Park Structure No. 9450-028P" (Denver, CO: Federal Highway Administration, Region 8 Office of Western Bridge Design, September 1975), 1.

IV. BIBLIOGRAPHY

Cammerer, Arno B., Acting Director, National Park Service, to Secretary of Interior, 13 August 1929. National Archives, RG 48 Box 1991 File 12/7, Mount Rainier National Park Roads.

Edwards, John H., Assistant Secretary of the Interior, to J. D. Tobin, Portland, Oregon, 31 July 1928. National Archives, RG 48 Box 1991 File 12/7, Mount Rainier National Park contracts.

Fitzsimons, G. Gray and Martin Stupich, National Park Service, Pacific Northwest Regional Office. Inventory form for the White River Bridge. Mount Rainier National Park Cultural Resources Survey, 2 August 1983.

Short, C. R., Associate Highway Engineer, Bureau of Public Roads. "Location Survey Report (1932) on Yakima Park Highway, Route No. 3, Mt. Rainier National Park, State of Washington." Portland, OR: Bureau of Public Roads, District No. 1, 1932.

Tipton, R. R., Assistant Highway Engineer, Bureau of Public Roads. "Final Report (1929) on White River Bridge, White River Road, Mt. Rainier National Park, State of Washington, 3-A1, 3115." Portland, OR: Bureau of Public Roads, 1929.

Tomlinson, O. A., Superintendent, Mount Rainier National Park. Superintendent's Monthly Report, July 1928. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

--Superintendent's Monthly Report, August 1928. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

--Superintendent's Monthly Report, October 1928. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

--Superintendent's Monthly Report, June 1929. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

--Superintendent's Monthly Report, July 1929. MORA Archives, Box H2615, Superintendents' Monthly Reports 1928-1931 file.

U.S. Department of Agriculture, Bureau of Public Roads. "Mt. Rainier National Park, White River Arch, Yakima Park Road, East Boundary-White River Crossing Sect., Pierce County, WN" (sic). Construction drawing P-15-7. Portland, OR: Bureau of Public Roads, District No. 1, 8 June 1928. Engineering Division files, Mount Rainier National Park.

U.S. Department of the Interior, National Park Service, Division of Landscape Architecture. "Arch Ring Layout, White River Arch (Right Half), Yakima Park Road, Mt. Rainier National Park." Construction drawing R 814 Sheet 1. San Francisco, CA: National Park Service, Division of Landscape Architecture, 3 August 1928. Engineering Division files, Mount Rainier National Park.

--"Arch Ring Layout, White River Arch (Left Half), Yakima Park Road, Mt. Rainier National Park." Construction drawing R B14 Sheet 2. San Francisco, CA: National Park Service, Division of Landscape Architecture, 3 August 1928. Engineering Division files, Mount Rainier National Park.

--"Architectural Plans, White River Bridge, Yakima Park Highway, Mt. Rainier National Park." Construction drawing R 814. San Francisco, CA: National Park Service, Division of Landscape Architecture, 14 June 1928. Engineering Division files, Mount Rainier National Park.

U.S. Department of Transportation, Federal Highway Administration. "Bridge Safety Inspection Report, White River Bridge, Mt. Rainier National Park Structure No. 9450-028P." Denver, CO: Federal Highway Administration, Region 8 Office of Western Bridge Design, September 1975.

Wright, R. B., Highway Bridge Engineer, Bureau of Public Roads. "Final Inspection Report, White River Bridge, Rainier National Park." 17 July 1929. Attached to R. R. Tipton, Assistant Highway Engineer, Bureau of Public Roads. "Final Report (1929) on White River Bridge, White River Road, Mt. Rainier National Park, State of Washington, 3-A1, 3115." Portland, OR: Bureau of Public Roads, 1929.